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Data-Driven Environment Modeling for Adaptive System-of-Systems

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INTRODUCTION

- The *System of Systems (SoS)* and modern systems are often coupled with complex and dynamic environment.
- To design an adaptive SoS, analyzing and understanding the environment is required, but there is a lack of practical guidelines of analyzing the environment.
- To guide practical environment modeling of adaptive SoS, we propose a **data-driven environment modeling process based on a meta-model**.

APPROACH

A. Environment Modeling Process

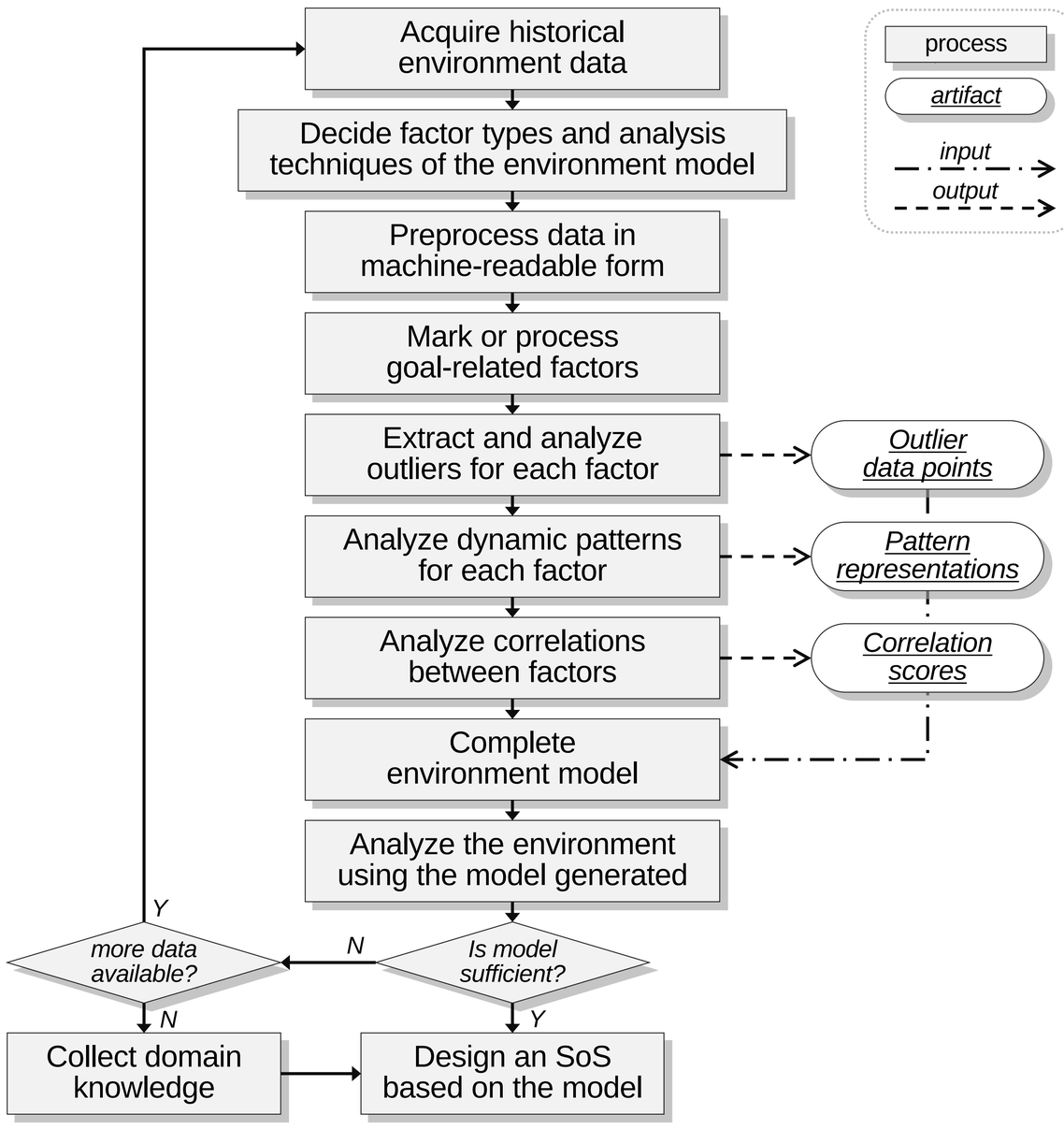

Figure 1. Overall environment model generation process

B. Meta-model of the Adaptive SoS Environment

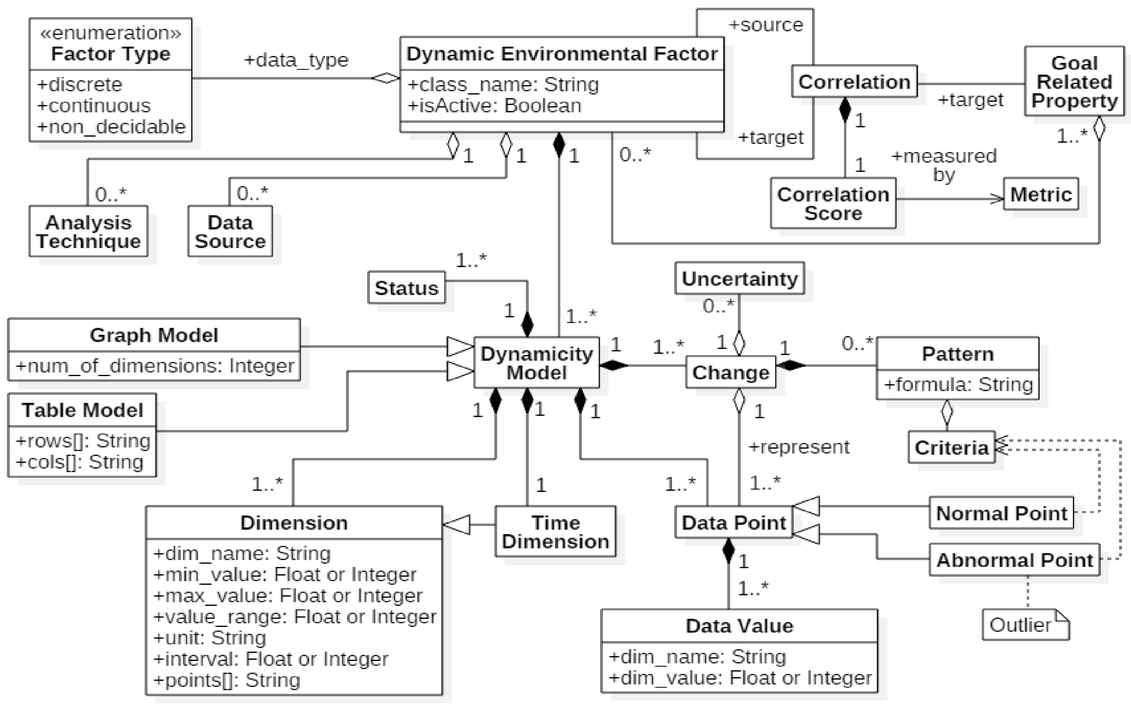

Figure 2. A metamodel of environment for adaptive SoS (based on [1])

CASE STUDY: Real Traffic Environment

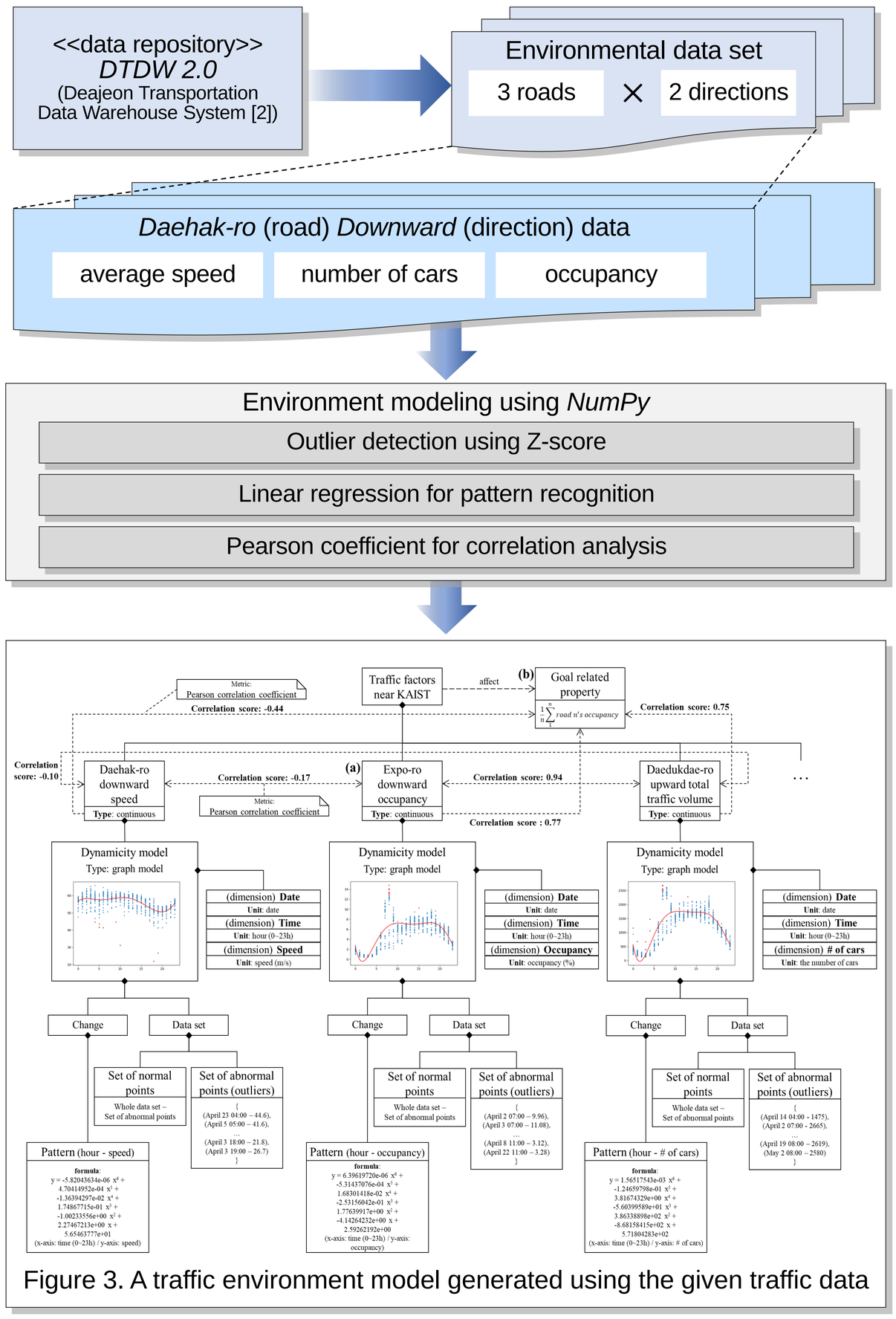

Figure 3. A traffic environment model generated using the given traffic data

CONCLUSION

- We proposed an environment modeling method for adaptive systems-of-systems (publicly available at [3]).
  - Data-driven environment modeling process using historical environmental data
  - A metamodel of the adaptive SoS environment to guide environment modeling in terms of data
- On the case study, we have shown that our modeling process can help engineers to obtain the essential understanding of the environment.

REFERENCES

[1] Young-Min Baek, Jiyoung Song, Yong-Jun Shin, Sumin Park, and Doo-Hwan Bae. 2018. A meta-model for representing system-of-systems ontologies. In 2018 IEEE/ACM 6th International Workshop on Software Engineering for Systems-of-Systems (SESoS). IEEE, 1–7.

[2] DTDW 2.0 - http://tportal.daejeon.go.kr

[3] http://se.kaist.ac.kr/starlab/studies/study-1-sos-and-environment-modeling/2-environment-modeling-of-sos/

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